

10046

Sample 10046 is a sub-angular, dark grey, fine breccia. This sample originally weighed 663gm, and measured 10 X 7.5 X 8 cm. Sample was returned in ALSRC #1003. (Bulk Sample Container)

BINOCULAR DESCRIPTION BY: Kramer DATE: 11-8-75

ROCK TYPE: Fine breccia SAMPLE: 10046,193 WEIGHT: 120gm

COLOR: Dark grey DIMENSIONS: 5.0 X 4.5 X 2.8 cm

SHAPE: Sub-angular

COHERENCE: Intergranular – moderately friable
Fracturing – absent

FABRIC/TEXTURE: Anisotropic/Fine breccia

VARIABILITY: Homogeneous

SURFACE: Hackly and irregular

ZAP PITS: E₁, few. Others, none.

CAVITIES: Few – less than 2% of surface. Some are lined with glass and/or crystals.

COMPONENT	COLOR	% OF ROCK	SHAPE	SIZE (MM)	
				DOM.	RANGE
Matrix	Dk.Grey	90	-----	-----	-----
White Clast ₁	White	3	Angular	1.0	0.05-1.5
Brown Clast ₂	Honey Brn.	1	Sub-Rounded	0.8	0.05-4.0
Glass Spherules	Black	<1	Sub-rounded	0.5	<0.8
Basalt Clast	Lt. Grey	5	Sub-angular	2.0	0.1-2.5

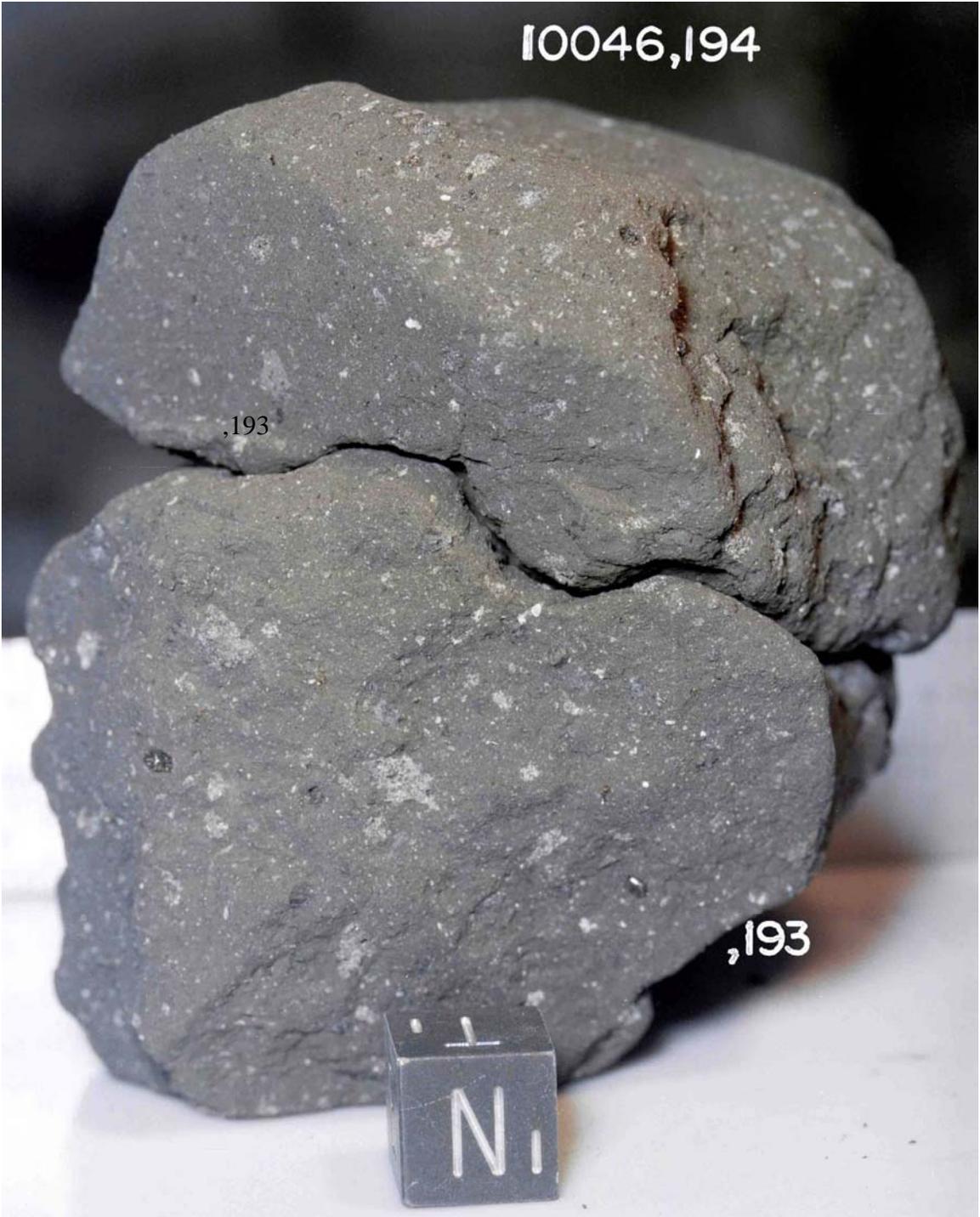
- 1) Single grain and aggregates of plagioclase (many crushed or shocked).
- 2) Brown pyroxene.

SPECIAL FEATURE:

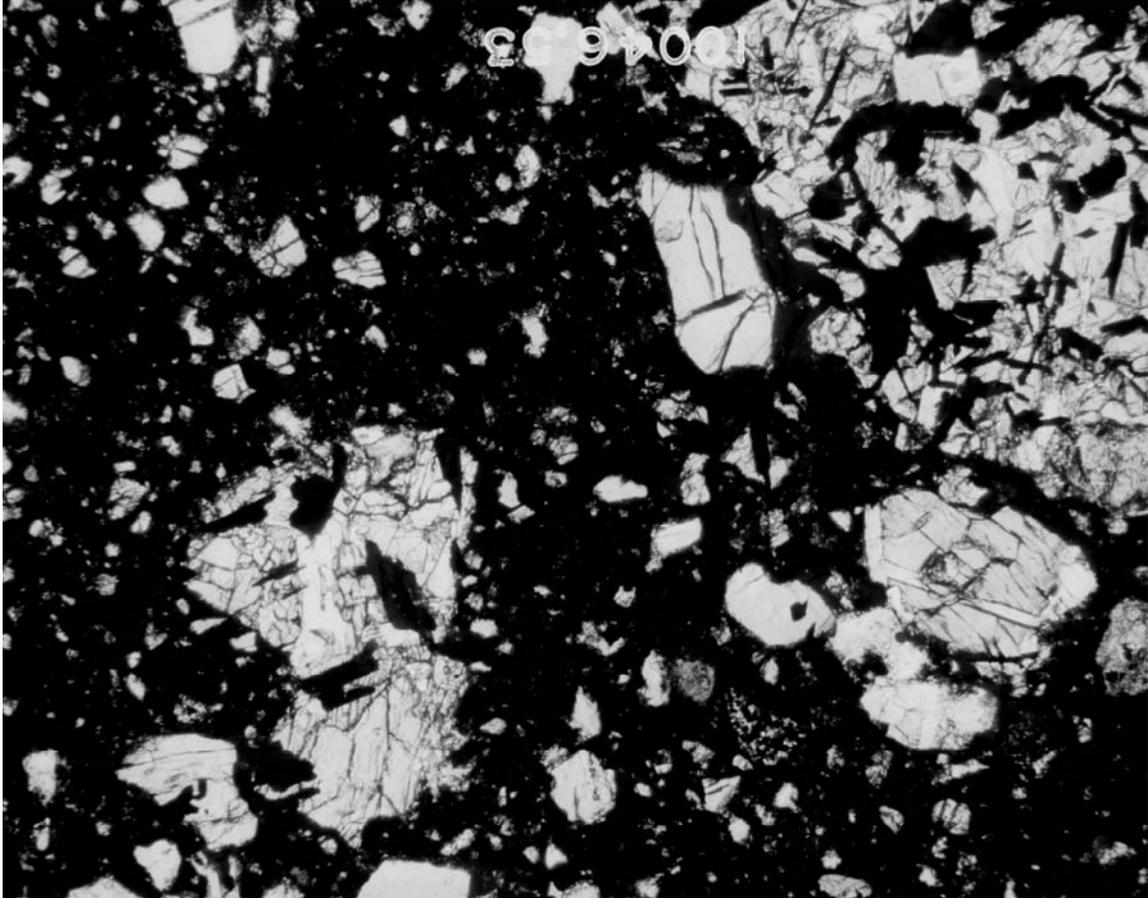
There are small patches of black, glassy spatter on several subsamples.



10046,0 Original PET Photo S-69-45608



10046,193,194 (S-75-33425)



SECTION: 10046,53 Width of Field: 1.39 mm plane light S-76-25829

THIN SECTION DESCRIPTION BY: Walton DATE: 6/29/76

SECTION: 10046,53

SUMMARY: Partly devitrified typical breccia with a relatively high glass content. Several large lithic clasts are present which show a large diversity in composition and type. The matrix is not as continuous as in other Apollo 11 breccias. The array is interrupted by the numerous mineral and lithic clasts.

Matrix 50% of Rock

<u>Phase</u>	<u>% Section</u>	<u>Shape</u>	<u>Size (mm)</u>	<u>Comments</u>
Dark Brown	100%	-----	< 0.001	High glass content; numerous small crystallites; somewhat discontinuous.

Mineral Clasts 30% Rock

<u>Phase</u>	<u>Relative Abundance</u>	<u>Shape</u>	<u>Size (mm)</u>
Pyroxene ₁	Very abundant	Angular to irregular	0.001-0.2
Plagioclase ₂	Present	Blocky to irregular	0.001-0.1
Opaques ₃	Few	Blocky to skeletal	0.001-0.2

- 1) Some exsolution and zoning; fair to poor extinctions.
- 2) Very scarce; a few shards; fair to good twins.
- 3) Most in clasts; some fragments in matrix.

Lithic Clasts 10% of Rock

<u>Type</u>	<u>Relative Abundance</u>	<u>Shape</u>	<u>Size (mm)</u>
Small	Very abundant	Rounded to irregular	0.001-1.0
Large ₄	Nine present	Rounded to irregular	>1.0

- 4)
 - a. Fine-grained basalt consisting of pyroxene, plagioclase and ilmenite.
 - b. Coarse-grained basalt consisting of pyroxene, plagioclase and ilmenite.
 - c. Coarse-grained basalt consisting of pyroxene, plagioclase and ilmenite.
 - d. Coarse-grained basalt consisting of pyroxene, plagioclase and ilmenite.
 - e. Fine-grained intersertal basalt consisting of pyroxene, plagioclase and ilmenite and mesostasis.
 - f. Crystal aggregation consisting of large skeletal crystals of ilmenite with small pyroxene, plagioclase, and ilmenite crystals; some glass in matrix.
 - g. Coarse-grained basalt which appears to be crushed as the crystals of pyroxene and plagioclase are polygranulated. Some ilmenite is present.
 - h. Fine-grained basalt consisting of pyroxene, plagioclase and ilmenite.
 - i. Fine-grained with high glass content with several mineral clasts; matrix yellow-brown.

Glass Clasts 10% of Rock

<u>Type</u>	<u>Relative Abundance</u>	<u>Shape</u>	<u>Size(mm)</u>
Yellow-orange ₅	Very abundant	Spherical to angular	0.001-0.3

- 5) Many spherical, ovoid and part spheres plus angular shards; most show little devitrification; some bubbles present.

Selected References: Adler et al., (1970), Dence et al., (1970); Essene et al., (1970), Lovering and Ware (1970).

HISTORY AND PRESENT STATUS OF SAMPLES – 6/29/76

10046 was removed from the Bulk Fines Container (ALSRC #1003) and split in the Bio Prep Lab. A 6.5gm chip was sent to PCTL for PET analysis. The parent rock was sawed and chipped in SPL. Remaining pristine samples were re-examined in SSPL. NOTE: There is a statement in the sample history data that this sample was originally contaminated in the Bio-Prep Lab.

PRISTINE SAMPLES:

12	0.17 gm	Fines. BP-SSPL
14	0.149 gm	Three small chips. Largest is 2.5.xmm. BP-SSPL
15	7.92 gm	Chips and fines. There are four chips larger than 1mm. BP-SSPL
67	7.27 gm	Chips and fines. The largest chip is 1X1X0.5cm. There is a small basalt chip in this sample. At some time during early processing, this sample was cross-contaminated with a basalt. BP-SSPL
68	5.55 gm	Chips and fines. BP-SSPL
193	120.18 gm	5.5X4.5X3.5cm piece. Mated with ,194. Two sawed faces (S ₁ , B ₁). E ₁ has a few pits. Other surfaces are fresh. BP-SPL-SSPL-RCL-SSPL
194	113.42 gm	6.5X6X3cm piece. Mated with ,193. One sawed face (N ₁ ,E ₁). One pitted face (few on S-W ₁). Other surfaces are fresh. BP-SPL-SSPL
195	27.25 gm	5X4X1cm sawed end piece. B ₁ is sawed. T ₁ has patina but no pits. Large brown clast (4cm) on T ₁ . BP-SPL-SSPL
196	17.38 gm	4X2X1.5cm sawed piece. T ₁ , B ₁ , and E ₁ are sawed. Others are fresh. BP-SPL-SSPL
197	30.60 gm	6 sawed chips. Shaped pieces with two to five sawed faces. No pitted surfaces. BP-SPL-SSPL
198	24.00 gm	Five large chips. Three have pits on one side. BP-SPL-SSPL
199	17.02 gm	<.25 small chips. Not dusted. BP-SPL-SSPL
200	39.70 gm	Chips and fines. BP-SPL-SSPL

RETURNED SAMPLES:

9	12.869 gm	Three chips. Largest chip has pitted surface.
46	15.328 gm	Fresh chip.
152	13.282 gm	Surface chip. E ₁ is pitted.

CHEMICAL ANALYSES

Element	Number of Analyses	Mean	Units	Range
SiO ₂	1	44.07	PCT	0
Al ₂ O ₃	1	11.71	PCT	0
TiO ₂	2	8.17	PCT	0.668
FeO	3	16.0	PCT	1.54
MnO	2	.209	PCT	0.017
MgO	1	9.12	PCT	0
CaO	2	13.01	PCT	1.4
Na ₂ O	3	.544	PCT	0.188
K ₂ O	2	.2	PCT	0.010
P ₂ O ₅	1	.229	PCT	0
H	1	55.0	PPM	0
Li	1	16.00	PPM	0
Rb	1	3.6	PPM	0
Cs	1	0.2	PPM	0
Be	1	6.0	PPM	0
Sr	2	167.5	PPM	5.0
Ba	2	249.5	PPM	61.0
Sc	3	69.0	PPM	8.0
V	1	68.0	PPM	0
Cr ₂ O ₃	3	0.303	PCT	0.026
Co	3	33.0	PPM	15.0
Ni	1	70.01	PPM	0
Cu	1	9.7	PPM	0
Zn	1	30.0	PPM	0
Y	1	190.00	PPM	0
Zr	1	620.0	PPM	0
Nb	1	38.0	PPM	0
Mo	2	0.365	PPM	0.67
Pd	1	0.1	PPM	0
Ag	1	0.02	PPM	0
Cd	1	0.8	PPM	0
Ta	3	1.63	PPM	0.4
W	1	0.35	PPM	0
Hf	3	11.8	PPM	2.4
Re	2	0.400	PPB	0.500
Os	2	0.500	PPB	0.520
Ir	1	0.012	PPM	0
Au	1	2.8	PPB	0
La	1	23.0	PPM	0
Ce	4	63.82	PPM	25.7
Pr	1	20.0	PPM	0
Nd	2	55.1	PPM	9.8

Element	Number of Analyses	Mean	Units	Range
Sm	3	15.8	PPM	10.3
Eu	3	1.98	PPM	0.06
Gd	1	20.75	PPM	1.5
Tb	1	4.5	PPM	0
Dy	3	24.93	PPM	10.1
Ho	1	9.0	PPM	0
Er	2	18.9	PPM	8.2
Tm	1	1.6	PPM	0
Yb	3	12.98	PPM	11.3
Lu	3	1.64	PPM	0.73
Th	1	2.8	PPM	0
U	1	0.58	PPM	0
B	1	9.0	PPM	0
Ga	2	5.15	PPM	0.5
In	2	0.048	PPM	0.064
Ge	1	0.39	PPM	0
Pb	1	2.0	PPM	0
N	1	260.0	PPM	0
As	2	0.05	PPM	0
Sb	1	0.005	PPM	0
Se	1	0.4	PPM	0
F	1	220	PPM	0
Cl	1	520.0	PPM	0
Br	1	0.2	PPM	0

Analysts: Morrison et al., (1970); Turekian & Kharkar, (1970); Kharkar & Turekian, (1971); O'Hara et al., (1974); Philpotts & Schnetzler, (1970); Friedman et al., (1970); Lovering & Butterfield, (1970); Lovering & Hughes, (1970); Wasson & Baedecker, (1970).

No Age References